

# Is there a place for elective therapeutic amputation in diabetic foot care?



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**D**iabetic foot disease is associated with significant morbidity and mortality (Boulton et al, 2005) and accounts for approximately 50% of all non-traumatic major lower-extremity amputations (LEA) in the UK (Vamos et al, 2010). There is evidence that well-organised multidisciplinary teams can reduce amputation rates (Krishnan et al, 2008; Schofield et al, 2009). However, in some instances advanced or progressive disease means amputation is inevitable.

Major LEA is often considered the most feared sequelae of diabetes. The personal and socio-economic burden of amputation makes it a “last resort”. However, the fact that nonhealing or recurrent ulceration can also be associated with a similar level of impairment in terms of quality of life (QOL) and cost should not be underestimated (Goodridge et al, 2005). As such, a well-planned, elective amputation, in which the person with persistent ulceration has been actively involved in the decision making, can in some cases be the preferred therapeutic option, when compared to the ongoing conservative management of chronic foot ulceration with its associated morbidity.

This article will consider the outcomes of diabetes related foot disease, which factors influence both the risk of amputation and the chances of successful rehabilitation post-amputation. It will also consider the potential benefits of elective versus emergency amputation in those individuals with nonhealing recalcitrant foot ulceration and the factors that can be addressed pre-amputation to improve post-operative outcomes.

## What are the outcomes of diabetes related foot ulceration?

In considering whether elective amputation is a reasonable therapeutic option, it is worth reviewing the outcomes of diabetic foot disease. Jeffcoate et al (2006) assessed ulcer- and person-related

outcomes in a cohort of 449 subjects presenting to a multidisciplinary diabetes foot service with ulceration over a 3-year period. Similar to the vast majority of UK centres, many of the index ulcers were superficial (79%), and around 40% were infected. Approximately half of participants had evidence of peripheral arterial disease. When ulcer-related outcomes were considered in isolation, 66% of index ulcers healed by 12 months. Person-related outcomes were considerably different; only 45% of patients had the desired outcome of a healed ulcer, without the need for amputation, with no recurrence, and still alive. A quarter (25%) of the cohort had a recalcitrant index ulcer or recurrent ulceration. The 1-year mortality rate in this cohort was high (17%), and a further 11% required amputation during 12 months’ follow-up.

Jeffcoate et al’s (2006) findings show that diabetic foot ulceration carries significant risk of morbidity and mortality, and less than half the patients achieve the desired outcome at 1 year. Thus, despite receiving aggressive multidisciplinary intervention some people – as a result of advanced disease – will require amputation. The key is to identify those individuals who are unlikely to achieve ulcer healing and provide them with timely, definitive intervention.

## Can you predict which individuals will require amputation?

Previous studies have highlighted that ulcer type has a significant impact on both the rate of amputation and mortality. The presence of lower-limb ischaemia has been shown to increase the risk of amputation 3-fold compared to purely neuropathic lesions. Survival is also significantly reduced in the presence of ischaemia with a 5-year survival rate of less than 50% in some series (Moulik et al, 2003). Wound classification systems can also help provide useful prognostic information. The original validation

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of the University of Texas classification system highlighted that the amputation rate for ulcers classed as “3D” (defined as ulceration extending to bone or joint with concomitant infection and ischaemia) was 100% (Armstrong et al, 1998). The authors also found that ulcer depth provides important prognostic information; patients with lesions that extended to bone had an 11-fold increase risk of amputation. Likewise, the presence of infection or ischaemia were strong predictors of amputation, and when both were present the risk of amputation increased 90-fold.

Research suggests that a significant proportion of people with diabetic foot ulceration will ultimately require amputation. Using ulcer- and patient-related characteristics we may be able to predict when amputation is the likely outcome. Thus, it could be argued that – once all other options have been exhausted – a timely, elective, planned amputation in an appropriate subset of people would be preferable to several months or years of unsuccessful conservative management.

**Is there ever a place for elective amputation?**

Given that within 1 year of presentation, more than 25% of people with diabetic foot ulceration will have undergone an amputation or died (Jeffocate et al, 2006), it is important that multidisciplinary diabetic foot teams, vascular and orthopaedic surgeons, and rehabilitation teams consider amputation as a therapeutic option, rather than as is often the case as a last resort. Furthermore, leaving amputation as a last resort often necessitates emergency surgery, which may compromise post-operative outcomes.

Before considering elective amputation, all potentially reversible factors need to be addressed. This should include maximising pressure relief, resolving infection, achieving good glycaemic control, and treatment of any remediable vascular compromise. Aggressive management of cardiovascular risk factors has also been shown within a diabetes foot service to decrease mortality (Young et al, 2008). If there is no improvement in the wound in spite of best medical management, it could be argued that the benefits of elective amputation outweigh the risks of ongoing conservative management.

The patient must be at the centre of care and actively involved in the decision making process. Protracted, conservative ulcer management is likely to be associated with ongoing clinic visits, hospital admissions, and ongoing (personal and health service) costs. This can also be the case post-amputation. Quality of life (QOL) in both these settings is therefore an important determinant in the decision making process. Some research suggests that amputees have a better QOL than those with active ulceration in domains such as pain and physical function (Boutoille et al, 2008). Goodridge et al (2005) found that mobile amputees have a better QOL than those with active ulceration. Another important consideration is the finding that active foot disease negatively impacts on the QOL of carers (Nabuurs-Franssen et al, 2005). There is also the possibility that a prolonged conservative approach with enforced immobility as a result of ongoing ulceration, thus diminishing what is often an already compromised cardiovascular reserve.

**What can be done pre-amputation to improve post operative outcomes?**

It is important to be honest with patients and provide them with accurate prognostic information. Realistic expectations – in terms of outcomes, amputation, and rehabilitation – should be provided to the patient and their family or carer. It is the collective responsibility of the multidisciplinary team to equip the patient with information that allows them to weigh-up the risks and benefits of a conservative versus operative approach, and ensure that the patient is at the centre of any decision. Consistency in the information provided is essential; uncertain or mixed messages can undermine decision-making and management.

Involving the rehabilitation team in pre-operative discussions about amputation can be invaluable. This allows the patient to achieve an overview of the rehabilitation process and help set realistic post-operative goals. The opportunity to meet with amputees may also be a positive one for patients.

Third sector involvement, where available, can be a source of valuable support and information for patients and carers. Organisations such as The Murray Foundation ([www.murray-foundation.org.uk](http://www.murray-foundation.org.uk)) offer pre-amputation support, as well as providing toll-free helplines staffed by accredited

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counsellors, and also host support groups and hospital visitor schemes.

There are several factors that determine outcome post-amputation and this includes age, pre-operative activity level, comorbidities, limb length, stump quality, planning, and patient motivation (Sansam et al, 2009; Remes et al, 2009). Elective amputation ensures that patients are actively involved in the planning process and therefore may have a beneficial effect on their motivation. Comorbidities may be compromised by intercurrent sepsis. This risk can be minimised by operating in an elective setting. There is also opportunity to optimise activity level pre-operatively. An elective approach may also preserve limb length and decrease the chance of stump problems, all of which are likely to improve the chance of a successful post-operative outcomes. By contrast, considering amputation as a last resort often necessitates an emergency procedure, which may compromise the situation and be detrimental to post-amputation outcomes (Table 1).

**Conclusions**

Well-organised multidisciplinary foot teams can reduce diabetes-related amputation rates and improve survival. All efforts should be made to ensure timely access to such services so that aggressive intervention can improve the outcome for people with active foot disease. Amputation should be regarded as a therapeutic strategy for those individuals who have advanced or progressive disease that a multidisciplinary approach has failed to improve. In many recalcitrant ulcers with

established peripheral arterial disease, elective amputation should be considered the preferred treatment option.

It is important that the multidisciplinary team adopt an honest, realistic, and consistent approach to diabetic foot care, with the active involvement of patients and carers. Diabetic foot care should not simply focus on ulcer outcomes, but holistically at the patient, with the ultimate aim of improving QOL and survival rates. Sometimes, that may mean elective therapeutic amputation. ■

**Table 1. Factors influencing outcome post-amputation and the role of elective versus emergency surgery**

Factor	Amputation	
	Elective	Emergency
Age	-	-
Pre-operative activity level	++	+
Comorbidities	+	+++
Limb length	++	+
Stump quality	++	+++
Planning	++++	+
Patient motivation	+++	+

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